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ABSTRACT

This document contains the two issues of "Rural Mathematics Educator" published in 2002. This newsletter of the Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics (ACCLAIM) includes articles on rural mathematics education, as well as information and descriptions of professional development opportunities for rural mathematics teachers. The first issue introduces ACCLAIM, one of seven National Science Foundation-funded centers intended to address the looming shortage of math teachers and the need to enhance mathematics capacity and knowledge. ACCLAIM's unique concern is the intersection of mathematics education and rural education; its rural mission is addressed through four separate initiatives focused on capacity building, teacher education, professional development, and research. Articles in this volume are: "Doubt, What Works, and the Work of Research" (Craig Howley); "What's Rural?"; "Some Questions and Answers about the ACCLAIM Research Initiative" (Jim Schultz); "Doctoral Program Centerpiece of Capacity Building Initiative's Efforts" (Reid Davis); "The Doubtful Role of Doubt" (Stephanie Starcher); "What Is Mathematics?" (James E. Schultz); and "Algebra Investigations Using Models: An Integrated Approach to Professional Development." Also included are notices of conferences, workshops, summer institutes, and publication opportunities; news from the ACCLAIM initiatives; and lists of advisory board members and suggested Web sites. (SV)

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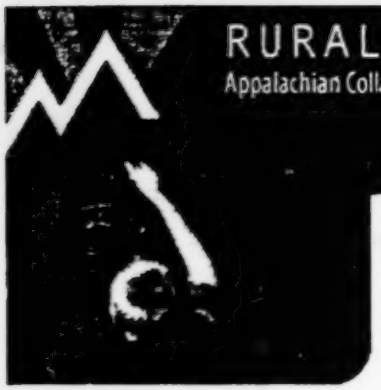

RURAL MATHEMATICS EDUCATOR

Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics

Rural math education information at your fingertips. Updated quarterly by ACCLAIM.

Vol.1 No.1
June 2002

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WHAT TO LOOK FOR

In our second volume of the Rural Mathematics Educator, our Research Lens will include a dialogue between two mathematics scholars regarding the idea of best practices in education. We will also feature a think-piece by Dr. Jim Schultz, Ohio University Professor of Mathematics that focuses on question, "What's math?"

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Mathematics Education: Our Unfilled National Need...

Faced with a national shortage of qualified math teachers and pending retirements of over half the university faculty who prepare math educators, the National Science Foundation (NSF) has launched an intensive $100 million dollar campaign to regenerate teaching expertise, research development, and leadership in mathematics by creating teaching and learning centers throughout the United States. ACCLAIM—the Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics—is currently one of seven such centers located around the nation. The Center is directed by Bill Bush (University of Louisville) and Vena Long (University of Tennessee-Knoxville).

ACCLAIM's mission is to enhance mathematics capacity and knowledge, in part through research focusing on math education in rural schools and through dramatic improvements in access to advanced degree programs in math education. In addition, ACCLAIM incorporates teacher education and professional development work: capacity building of this sort links schools and districts, pre-service teacher education, masters and doctoral programs, and post-doctoral research efforts.

The Center's unique concern is the intersection of mathematics education and rural education. Rural areas have historically been isolated from and without access to such capacity building opportunities, and the NSF hopes that ACCLAIM will be able to assist math educators and learners in developing a comprehensive understanding of mathematical concepts and abilities as well as analytical skills that are applicable in various settings. ACCLAIM approaches the learning and teaching of mathematics with field-based activities reflective of the issues confronting rural places.

In addressing this rural mission, ACCLAIM combines the individual efforts of four separate initiatives to develop professional experiences and knowledge that are meaningful to the real issues and problems rural schools encounter.

- The **Capacity Building Initiative**, centered at the University of Tennessee-Knoxville, allows graduate students to explore advanced mathematics degrees through cohort programs at the masters and doctorate levels.
- Marshall University hosts the **Teacher Education Initiative** in an effort to improve the preparation of undergraduate mathematics education students, working principally with schools and colleges of higher education to enhance collaboration and improve undergraduate curriculum.
- The **Professional Development Initiative**, facilitated by the Appalachian Rural Systemic Initiative from its home in the Kentucky Science and Technology Corporation, provides intensive training for middle and high school faculty members and preservice teachers. Professional Development Teams adapt training to local rural needs peculiar to each site.
- The **Research Initiative**, located at Ohio University, conducts research related to ACCLAIM's goals, disseminates information about best practices in the field, and assists the other initiatives in the collection and analysis of data. This initiative, unlike the others, maintains a national (not only a regional) rural scope.

ACCLAIM is steadfast in establishing a national agenda for prioritizing further research related to rural math education. To improve the existing research base, ACCLAIM supports rural place-based studies, analyses of mathematics education across rural and non-rural settings, and studies of effective practice to serve rural schools and communities. The research agenda is an "open architecture" model, with problem sets broadly defined to accommodate emerging issues.

RURAL MATHEMATICS EDUCATOR
Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics

Welcome to the Rural Mathematics Educator

by Stephanie Starcher, Ohio University & Warren (OH) Local Schools

Have you ever wondered if anyone cares about the struggles of teaching and learning mathematics in rural schools? Did you ever wish that someone would help people understand what it means to work in rural schools? Or how to access discussions about "what works" for math education in rural settings? Or studies about mathematics education in rural communities?

Those of us involved with ACCLAIM, a project supported by the National Science Foundation and devoted to mathematics learning and teaching in rural communities, do care about these things. We have lived, worked, taught, and studied math education and rural education. Many of us live and work in rural communities. (I'm currently a principal of two small rural schools.)

This is almost totally new ground in American education. Through this newsletter (*Rural Mathematics Educator*), we'll be addressing questions about rural mathematics education that have seldom been asked and have almost never been answered. We'll summarize what we know, write about what we don't know, and tell you what's being done to find out—and sometimes how that's being done. Our lens for considering these issues is research, but in this newsletter we want to be clear and accessible to well-informed educators and a thoughtful lay audience. We want to treat substantial issues, but with user-friendly language. In short, our lens is "research," but we expect to include something for almost everyone under that banner.

The *Rural Mathematics Educator* is just one publication to be developed by the ACCLAIM Research Initiative to inform educational researchers, school leaders, teachers, and policy makers about issues that shape mathematical learning in rural schools. The newsletter will update readers on the work of the four ACCLAIM initiatives, on professional development resources, interesting conferences, and new or forthcoming research. Each edition of the newsletter may also feature short essays, provocative "think-pieces," and something uncommon in any newsletter: information related to conducting research about mathematics education in rural communities.

If you are interested in suggesting a topic of study, would like to announce a professional development activity, or just have a question to ask please e-mail me: wl_sstarcher@seovec.org.

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ACCLAIM Enrolling First Doctoral Cohort for Summer 2002

Interested in obtaining a doctorate degree emphasizing the teaching and learning of mathematics in rural education WITHOUT leaving your family and work for extended periods of time? Beginning this summer, Ohio University and the Universities of Kentucky, Louisville, and Tennessee are cooperating to offer a mathematics education doctoral program that comprises three years of extensive coursework in mathematics, mathematics teaching methods, rural sociology, and research methodology, followed by a dissertation.

Cohort members will attend a five-week seminar each summer of the first three years on a selected university campus (room and board provided). The rest of the coursework will be completed via distance learning courses. Because students work from their home base throughout most of the year, each cohort member will be assigned a mentor in the form of ACCLAIM scholars from their geographic area. The summer sessions and a yearly internship at home will satisfy the traditional doctoral residency requirement.

Applications are now being accepted for the first cohort that begins this summer at the University of Knoxville. Applications are available at http://web.utk.edu/~acclaim. Subsidies are also available for tuition.

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RURAL MATHEMATICS EDUCATOR
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Doubt, What Works, and the Work of Research

by Craig Howley, Ohio University

The RME is written for a wide audience, but with the work of research clearly in view. We are trying to view the work of ACCLAIM, then, through a research lens.

What does that mean?

For one thing, when we select and describe resources to feature, we ask ourselves, "What's the evidence that the resource has merit?" Also, when we print a feature story, we want to know, "What reasons does the author give for making claims? Does the resource offer readers the option of taking a different perspective?"

In other words, we're not just trying to summarize what others have claimed is good, or what others claim "works." Instead, a "research lens" looks on the world not with belief in authoritative statements about what's good or not, but with doubt. Although research efforts often (not always) seek "truth," the way they do that—from day to day and year to year—is with the tools of doubt: inquiry, critique, and outright rejection!

Rejection?!
Indeed, in quantitative educational research especially, rejection is probably the most common way of making a claim about the truth of a proposition. In quantitative research we use what's called the "null-hypothesis" most frequently. Significant findings mean, precisely, that we have rejected the null hypothesis, and actually found a statistically significant difference.

Doubt

Some readers—maybe many—will view these reflections about doubt as peculiar, and possibly even out of the mainstream. Doubt, though, is actually the foundation of "modern" science. Doubt is, for instance, central to the writings of Rene Descartes (the 17th century French philosopher and mathematician) and to Francis Bacon (the 17th century English statesman and scientist). Early scientists doubted that the world was actually the way they were told it was. Instead they observed, recorded measurements, described phenomena (for instance, celestial motion) based on observations, and they reached conclusions very different from those that prevailed at that time. All this doubt got them into considerable trouble.

This is very old news, but a very modern practice. We humans most often tend to believe what we're told—without demanding justification. Every time we say, "Just tell me what works," we're relinquishing responsibility for our own knowledge. Doubt applies not just to the way the world is (or is supposed to be) but also to what is said about it, including claims about what works. The evidence, most researchers think, is very important. An intuition that something works is a place to start, but it's not very convincing.

Doubt about What Works

It is true that "research" doesn't look like an everyday activity, that research reports are difficult to read and understand, and that researchers exert little effort to help teachers and administrators understand. But doubt is important in practice as well as in research.

In education, as in the supermarket, a great many things are described with the words "It Really Works!" But do these things work? How do we know? What's the evidence? Are there limitations (it works here but not there)? Contingencies (it works only in combination with X, Y, and Z)? What's the criterion for "working" (does it do no harm, produce advantages in some areas but no disadvantages in others, and so forth)?

If more of us asked such questions—expressing doubt and being less gullible, we'd avoid a couple of serious ills and embrace a couple of critical advantages.

- First, we'd become less cynical about things that are supposed to work but don't. We'd be less likely to be victimized by shoddy educational endeavors (from whatever source—publishers, government, our best friends). If something that looks good doesn't work, we'd be less likely to blame ourselves.
- Second, we'd realize some advantages. We'd be more likely to understand the limitations

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of the claims made and the contingencies and limitations under which something might or might not work. When something doesn't work we'd be more likely to examine our school or classroom in an effort to develop hunches about such contingencies and limitations. Most importantly, we'd be much more likely to appreciate the complexities of schooling, complexities not well served by fads, silver bullets, and quick fixes.

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RURAL MATHEMATICS EDUCATOR
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What's Rural?

A research article (Bosak & Perlman, 1982) once enumerated nearly 250 definitions of "rural" used by sociologists in research studies. Most scholars working in rural education and sociology now take the view that finding the right definition, or the single best definition, is not worth the energy required. In part, this view stems from rejections of "essentialist" views of reality. That is, most of us no longer believe that there really is one best definition or even one best way to do something.

The debate over what's rural may have been sharper 20 years ago, so perhaps the only difference between now and then may be that researchers are less troubled by wild differences in definitions. The word "perhaps" in the last sentence indicates a hypothesis, but it's a hypothesis I'm not personally buying.

If one is concerned to develop a body of work that systematically addresses rural issues, a consistent definition is helpful, and that definition shouldn't be terribly uncommon. This is a problem, especially, for quantitative researchers, but it can be a problem for qualitative researchers too, especially if they are looking for approximately comparable (or predictably different) sites for case-study research.

So let's get to the point. What are useful definitions of rural? Is my rural your rural? And what makes a school rural? I personally favor just two definitions.

Definition one. Educational researchers often use the locale types initially developed by Frank Johnson of the National Center for Education Statistics (Johnson, 1988). The codes were developed specifically to provide a locale descriptor for each of the nearly 85,000 schools in the United States. There are now eight locale codes, but three of the eight are relevant to rural: small-town schools, rural schools outside metropolitan areas, and rural schools within metropolitan areas. These codes are very handy if you are developing a survey-research project with hundreds or thousands of schools. However, you can't count on the fact that one rural school, thus identified, will have much in common with another. Some of these "rural" schools will be in places that look relatively much more suburban than the places where other "rural" schools are located. With large numbers of cases (several hundred or thousand), however, these differences aren't that important. For an online discussion of "What's Rural," with particular emphasis on the Johnson Codes, see National Center for Education Statistics (2002), in the reference list.

Definition two. Another definition would usually be more useful for selecting sites for case-study research, or to develop rich descriptions of rural education settings. That definition is familiar to everyone: if you think you're rural, you are. The definition is a bit flippant, to be sure, but it conveys the properly internalized sense of reality that qualitative researchers prize (educational ethnographers in particular). It's a realm of subjective meanings best expressed by informants.

There is obviously much more to this question than these two answers. The Economic Research Service of the U.S. Department of Agriculture has very interesting typologies of non-metropolitan counties by "economic type" and by "policy type" (Cook & Mizer, 1994; Economic Research Service, 2002). And it's probably important to understand that statistical definitions of "rural" in most nations (as in the U.S.) comprise what's left over after metropolitan areas are defined, and that this negative definition is embedded in the NCES Johnson Codes.

It's good to realize that you could, with considerable effort, fashion much more sophisticated and multi-dimensional definitions of "rural." Relevant concepts would include the following: population sparsity; evenness of population dispersion (i.e., spatial dispersion versus spatial clustering); institutional accessibility (distance from key institutions like interstate highways, hospitals, colleges, and so forth); commuting patterns; and on and on. In the end, the appropriately sophisticated and multi-dimensional definitions have the problem noted at the outset of this article: uncommonness. They become the proprietary scheme of a single researcher, unlikely to be used by others.

What's rural, really? Perhaps the best definition is the ethnographer's favorite: "If you think you're rural you are." There's research on this, in fact. In an unpublished paper, Gary Huang

studied the correlation of self-reported rural classification and officially designated non-metropolitan locale. The correlations were very strong, (+.80 and stronger). If you're really doubtful (see article "Doubt, What Works, and the Work of Research") about this, you can write to Gary at: ghuang@csrincorporated.com.

References

Bosak, J., & Perlman, B. (1982). A review of the definition of rural. *Journal of Rural Community Psychology,* 3(1), 3-34. (ERIC Document Reproduction Service No. ED 238 667).

Cook, P., & Mizer, K. (1994). *The revised ERS county typology* (ERS Rural Development Research Report No. 89). Washington, DC: Economic Research Service, USDA. Retrieved March 11, 2002 from: http://www.ers.usda.gov/publications/rdrr89/rdrr89.pdf

Economic Research Service. (2002). [County typology codes webpage]. Retrieved March 11, 2002 from: http://www.ers.usda.gov/briefing/rurality/Typology/

Johnson, F. (1989). *Assigning type of locale codes to the 1987-88 CCD public school universe.* Paper presented to the annual meeting of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. ED 312 113).

National Center for Education Statistics. (2002). ["What's Rural?" from the *Navigating Resources for Rural Schools* website]. Retrieved March 11, 2002 from: http://nces.ed.gov/surveys/ruraled/WhatsRural.asp

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Meet ACCLAIM's National Advisory Board Members

Working behind the scenes, a panel of extremely knowledgeable and talented educators is helping ACCLAIM establish its direction. This group is comprised of educational experts who possess a broad range of skills, expertise and experience. We are very pleased to introduce ACCLAIM's National Advisory Board Members:

Dr. Lida Barrett
Retired from University of Tennessee

Dr. Patricia Campbell
University of Maryland

Dr. Thomas Cooney
Retired from University of Georgia

Dr. F. Joe Crosswhite
Retired from Ohio State University

Dr. C. Henry Edwards
Retired from University of Georgia

Dr. Melvin George
Retired from University of Missouri

Dr. Shirley Hill
Retired from University of Missouri-Kansas City

Dr. Mary F. Hughes
University of Arkansas

Dr. Libby Krussel
University of Montana

Dr. Gerald Kulm
Texas A & M University

Dr. Robert Pittman
Western Carolina University

Dr. Maureen Porter
University of Pittsburgh

Dr. Barbara Reys
University of Missouri

Dr. Wimberly Royster
Appalachian Rural Systemic Initiative
Retired from University of Kentucky

Dr. Paul Theobald
Wayne State College

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Professional Development Initiative

Mathematics Professional Development Teams Being Formed at Middle and High School Sites in Four States
by Steve Henderson, ARSI

Mathematics Professional Development Teams are being organized at sites across the ACCLAIM region. The activities of the teams will vary based on individual school needs but will all focus on creating "job-embedded" professional development that focuses on standards based instruction and curriculum development. PDT schools will have a Program Improvement Review (PIR) to establish program needs and will use the report to develop a strategic plan for program improvement. The Professional Development Teams will be composed of mathematics teachers, pre-service mathematics teacher education students, ARSI Teacher Partners, and university mathematics educators.

Each team, working collaboratively, will define the professional development and resource needs of the department, as well as the needs of individual members. The needs might include enhanced knowledge of mathematics, revised curricula, improved teaching and assessment, or technology support. University mathematics educators will facilitate the planning and professional development activities of the Professional Development Teams and serve as a resource for program development efforts.

ACCLAIM intends to establish Professional Development Teams across the region by the fifth year of the project. For further information regarding participation as a Professional Development Team site, please contact Stephen Henderson by phone at (859) 255-3511 or shenderson@arsi.org or Ron Pelfrey r.pelfrey@home.com

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Program Improvement Review Training Held February 12-13, 2002

Ron Pelfrey conducted a Mathematics Program Improvement Review (PIR) training in Lexington, Kentucky on February 12-13, 2002 for 39 mathematics educators from across the ACCLAIM region. The PIR trainees will work with Ron and other experienced reviewers in conducting PIR's for ACCLAIM schools.

The Program Improvement Review is designed to provide a comprehensive assessment of a school's mathematics program based on a set of standards derived from "best practices." The process includes a one-day site visit to the school in which the team examines all aspects of the program. Interviews are conducted with teachers, the school administrator, students, and parents; the school's curriculum and all related documents are carefully reviewed; and, the school's mathematics assessment data is analyzed. The program is rated on a set of standards from which a narrative explanation and recommendations are derived. The report is given to the school principal and serves as the basis for program reforms.

The process has been successfully implemented in more than 200 schools across Kentucky, Tennessee, Virginia, West Virginia, and Ohio and has led to improved student performance. Many schools, having had a PIR four-five years ago, are asking for a second PIR to assess their improvement efforts. A procedure has been developed for this purpose and has been implemented in several school districts in the region.

For more information concerning a mathematics or science Program Improvement Review, please contact Stephen Henderson (shenderson@ARSI.org) or Ron Pelfrey r.pelfrey@home.com

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Some Questions and Answers About the ACCLAIM Research Initiative

by Jim Schultz, Ohio University

Q1. What is the purpose of this research?
The purpose is to inform mathematics education efforts in teacher education, professional development, and capacity building (graduate programs) in rural communities.

Q2. What is the scope of this research?
Plans call for three types of research addressing the intersection of the large body of research in mathematics education with the comparatively smaller body of research in rural education:
a. Landscape studies which summarize existing and emerging research.
b. Comparisons of mathematics education in rural and non-rural settings.
c. Reports of best practices.

Q3. Who will do the research?
A deliberate effort is being made to team rural researchers with mathematics education researchers. Researchers will include recognized researchers in the two areas, as well as graduate students and others building their research abilities. A special effort will be made to generate contributions from teachers and students in Appalachian schools.

Q4. Who is the audience for this research?
While formal dissemination to other researchers will be undertaken, provisions will be made to facilitate making research results available to teachers and administrators less likely to read technical journals.

Q5. Where will the research be published?
The principal venue will be web-based. However, occasional monographs in print form will be developed. Cooperative efforts with existing journals in rural education and mathematics education, such as the creation of focus issues, will be encouraged.

Q6. What support is provided?
ACCLAIM can provide limited funds for expenses (and occasionally honoraria) for approved research efforts by established researchers and graduate students.

Q7. What other activities support the research?
Contacts are already in place with existing organizations dedicated to research in mathematics education and/or rural education. Plans are underway for sponsoring a conference and a contest. The conference will bring rural and mathematics researchers together later this year to establish collaborations. The contest will encourage teachers and students to share experiences with mathematics education in rural settings.

Q8. How can I get more information about the research initiative?
Readers are encouraged to visit these websites and watch for updates in future issues of this newsletter:

http://oak.cats.ohiou.edu/~mh112394/ (temporary websites of the ACCLAIM Research Initiative)

http://www.ACCLAIM-Math.org/ (main ACCLAIM website)

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Suggested Links

Clearinghouse on Rural Education and Small Schools
http://www.ael.org/eric/
The ERIC Clearinghouse on Rural Education and Small Schools provides access to the body of literature related to rural schools. We recommend you visit the website because it provides access to research and discussions that reflect differing opinions on rural education.

Navigating Resources for Rural Schools
http://nces.ed.gov/surveys/ruraled/
Data and periodic studies prepared by the National Center for Education Statistics and available resources are listed by the U.S. Department of Education (Navigating Resources for Rural Schools). We have chosen to include this website in our RESOURCE REVIEW because it highlights various ways researchers define 'rural' (see related article, "What's Rural?") and provides a comprehensive inventory (with contact information) of organizations and agencies involved in rural education.

Status of Public Education in Rural Areas and Small Towns
http://www.nea.org/publiced/rural.html
This report from the National Education Association synthesizes a great deal of information about rural schools in a single short document. Topics include schools and students, school employees, teaching assignments, compensation, teachers' opinions, teacher supply and demnd, school conditions, technology, and funding. The report concludes with the union's "strategic recommendations" for imporving rural education.

Resources for Parents, Teachers and Gifted, Talented, Creative and Promising Mathematics Students
http://www.nku.edu/~mathed/gifted.html
This site is being constructed at Northern Kentucky University through the Department of Mathematics and Computer Science and is designed as a resource for students, parents and math educators. The website particularly targets practicing math educators who are interested in virtual math experiences for students and professional development opportunities available this summer. The URL also provides information for contacting math educators who have research and teaching interests in developing mathematically promising students.

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Publishing Opportunities

National Council for Teachers of Mathematics

Online Journal of School Mathematics
NCTM's peer-review panel is interested in submissions that:

- enhance the understanding of mathematics
- reflect a vision of teaching and learning mathematics appropriate for the 21st century
- capitalize on the opportunities afforded by electronic media
- are useful to grades preK-14 teachers and teacher educators in their classrooms, and
- address a range of issues associated with equity and diversity in mathematics education that are compatible with the NCTM's "mathematics for all" statement (NCTM, 2002)

For article preparation and submissions details visit http://www.nctm.org/onmath/guidelines.htm

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National or Regional Events

June 17- June 26, 2002, Chapel Hill, NC
Center for Mathematics and Science Education Summer Workshop
MAST I: Mathematics and Science Technology I
Contact: Russ Rowlett (Rowlett@email.unc.edu) or http://www.unc.edu/depts/csme/index.html

June 19-21 Glenville Community College, WV
ACCLAIM Algebra Institute
Presenters: Jerry Pomeroy, Judy Pomeroy
Contact: Carter Chambers 888-262-3006 or chambersc@marshal.edu

July 14-17, 2002, Baltimore, MD
American Association of School Administrators
Rural/Small School Leaders Conference
Contact: 703-528-0700 or Info@aasa.org

July 15-17 UT Conference Center Knoxville, TN
ACCLAIM Algebra Institute
Presenters: Mark Taylor, Joan Meletiou
Contact: Terry Lashlet 888-459-4620 or tlashley@utk.edu

July 17-19 Comfort Inn Piketon, OH
ACCLAIM Algebra Institute
Presenters: Janet Benner, Mary Beth Bookman
Contact: Al Cote 888-258-0118 or cote@ohiou.edu

July 29-31 Prestonburg High School Prestonburg, KY
ACCLAIM Algebra Institute
Presenters: Ruth Casey Eddie Hamilton
Contact: Kim Zeidler 888-257-4836 or kzeidle@uky.edu

August 14-18 Chicago, IL
Rural Sociological Society Annual Meeting
Congress Plaza Hotel

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ACCLAIM Summer Institutes

ACCLAIM is sponsoring series of high-intensity staff development Mathematics Institutes in Kentucky, Ohio, Tennessee, and West Virginia. The focus of the 2002 Summer Institutes is algebra and the programs are designed to improve instructional skills of teachers of both pre-algebra and algebra I. ACCLAIM's overall goal for the summer institutes is to increase mathematics expertise and capacity in the Appalachian region by enhancing teacher skills in delivering instruction.

The specific objectives of the 2002 summer institutes are for the participants to:

- gain knowledge in the use of high-quality, standards-based instructional resources for algebra that can be immediately implemented in the classroom;
- enable teachers to align algebraic activities and resources to the state objectives for algebra I or pre-algebra;
- increase student interest in learning algebraic content;
- provide an enhanced instructional program in algebra resulting in improved student achievement on statewide assessments; and
- become comfortable with the use of alternative methods of providing instruction and assessment of algebraic content.

Participating teachers will receive reimbursement for travel expenses, a small stipend, and a set of teaching materials for their participation in one of these institutes.

Institutes will be held at sites in Ohio, West Virginia, Tennessee, and Kentucky. The West Virginia program is a specially designed project in which university and high school mathematics educators will have a joint training session focusing on both high school and college level teaching. Specific information regarding the location, date and times for the ACCLAIM summer institutes and registration information can be obtained by contacting the ARSI Resource Collaborative Coordinator in each state. The contacts for these institutes are:

Kentucky
Kim Zeidler, (800) 560-4298; kzeidle@uky.edu

Ohio
Al Cote, Ohio University, (888) 258-0118; cote@ohio.edu

Tennessee
Terry Lashley, (888) 459-4620; tlashley@utk.edu

West Virginia
Carter Chambers, (888)262-3006; chambers@marshall.edu

Additional information will be posted on the ACCLAIM web site by late April.

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RURAL MATHEMATICS EDUCATOR

Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics

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ACCLAIM's Teacher Education Initiative is featured in the next edition of the Rural Mathematics Educator. Our upcoming newsletter also includes a discussion between two sisters relating their unique experiences in rural schools as well as a review of articles on school size and cost effectiveness. If you have any ideas or particular requests for future newsletters, please contact our editor at wl_sstarcher@seovec.org.

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RURAL MATHEMATICS EDUCATOR
Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics

Doctoral Program Centerpiece of Capacity Building Initiative's Efforts

by Reid Davis

The ACCLAIM Capacity Building Initiative (CBI) seeks to promote student success in mathematics in rural Appalachia by increasing the number of teachers holding advanced degrees in mathematics education. The centerpiece of this effort, the new ACCLAIM doctoral program in mathematics education, stands out because it emphasizes mathematics and rural education.

Faculty members from the Universities of Louisville, Kentucky, and Tennessee and from Ohio University teach and advise the doctoral students long distance, allowing graduate students from rural areas to pursue degrees without extended absence from home, job, and family. The CBI co-directors, Vena Long, Carl Lee, and Reid Davis, with much help from the CBI advisory board, have spent the past year working on the design of the degree, seeking its approval, learning about teaching courses remotely, and advertising the degree to potential students. Their efforts bore fruit in the admission of the first ACCLAIM doctoral cohort of fourteen students this summer.

In designing the degree, the CBI first had to meet the requirements set forth by the National Science Foundation:

- Graduates must acquire 30 hours of post-baccalaureate mathematics;
- Every doctoral committee chair must hold graduate status in mathematics education;
- Every doctoral committee must include a mathematician.

Next, the CBI had to set admission and graduation requirements at least as stringent as those of all the partner universities. Finally, the CBI had to satisfy the co-directors' and advisory board members' judgment of what constitutes a feasible and excellent doctorate in mathematics education.

Because of the efforts of the advisory board, the doctoral program is up and running and enjoys the approval of the partner universities. The curriculum contains 21 semester hours in mathematics, 18 hours in mathematics education, 9 in rural education, and 12 in research methods (see http://web.utk.edu/~acclaim for further details).

The program assumes that entering students already possess some graduate mathematics, or that they will pick up additional courses in mathematics along the way. Students enter the program in cohorts of 20 in the summers of even-numbered years and then progress through the program together, serving as colleagues to one another. Each summer, cohorts take three courses in an intense, five-week session at one of the university campuses.

During the academic year, cohort members enroll in one or two courses at home each semester. These courses are delivered by some form of distance education. The universities share in the teaching of these courses so that students get the best courses and professors each institution has to offer. Students satisfy the doctoral residence requirement by completing an internship extending from the start of the second summer to the end of the third summer in the program. During the internship, students work closely with ACCLAIM scholars who live near the students and who possess expertise in the fields appropriate to the students' studies. By the end of the fourth summer, students are ready to take the comprehensive exams and start research for the dissertation.

Students in the program will take just over half their coursework remotely, in or near their homes. Advances in computing and telecommunications continually change the options for reaching these students. The CBI therefore seeks to become current in these technologies and to learn to use them to produce attractive, fruitful courses. To this end, Reid Davis (University of Tennessee Assistant Professor of Mathematics and Outreach Mathematician and CBI Co-director) taught a pilot distance education course, Discrete Mathematics for Teachers, during the spring semester of 2002. This course is a standard offering in the University of Tennessee's Master of Mathematics degree program for high school teachers. Its demand for handling mathematical notation made it especially valuable as a pilot course. A weekly 90-minute lecture was presented via videoconference on Tuesday evenings at the University of Tennessee to students at Walters State

Community College (Morristown, TN), the ASPIRE Center in Monticello, Kentucky, and Marshall University (Huntington, WV). The videoconference allowed students and the instructor to see and hear one another, making the lecture much like a typical classroom lecture.

A weekly question and answer session was held each Thursday evening during the semester so students could get help when completing homework assignments. These 60-minute sessions were made possible through the online chat facility of CourseInfo's Blackboard software. Course postings were listed on the UT website using the Blackboard. The instructor mailed, faxed, or emailed midterm and final exams to the sites, and students took them under a proctor hired by ACCLAIM.

The videoconference course was instructive to the CBI, largely because of problems it revealed. Holding a videoconference to multiple sites across state lines proved difficult, and technical problems with the delivery dominated the course. Most weeks at least one site – not always the same one – failed to connect or else received video without sound. As a backup plan, the studio taped the lectures and the ACCLAIM office sent copies to students who were unable to connect. Although students were wonderfully patient, the constant technical problems clearly wore on them. The difficulties slowed the lectures dramatically so that the course only covered half of the intended syllabus. Moreover, the cost of the videoconference was prohibitive, with each site having to place six simultaneous long-distance ISDN calls to connect.

There were positive aspects to the course. After problems initially connecting to the Blackboard software were resolved, the software performed admirably. The chat facility available through Blackboard proved invaluable for discussing homework. The "whiteboard" feature of Blackboard allows users to create symbols and diagrams necessary for an advanced mathematics course. The Thursday online discussions allowed the instructor and students to discuss problem-solving strategies in greater depth. The administration and grading of exams encountered some logistical problems but generally went well. It proved crucial to have good communication with a reliable contact at each site and to send out all test materials a week in advance.

During the spring semester, Vena Long of the University of Tennessee recruited students for the first ACCLAIM doctorate cohort. She and other members of ACCLAIM management team had done the spadework for this effort a year earlier, surveying teachers in the ACCLAIM region for interest. Her work produced abundant applications from qualified students. In the end, the CBI invited 19 applicants to join the cohort, and 14 accepted the invitation. Twelve of these come from the ACCLAIM region (Appalachian Kentucky, Ohio, Tennessee, and West Virginia) while the other two come from middle Tennessee and North Carolina. The cohort arrived in Knoxville on July 7 for the candidates' first intensive five-week session. This summe 's topics included the pedagogy of secondary and junior college mathematics with Dr. Long; geometry with Dr. Carl Lee of the University of Kentucky; and rural education with Dr. Alan DeYoung, also of the University of Kentucky. Students and professors worked with enthusiasm and diligence, getting the program off to a great start.

Several challenges loom in the near future for the CBI. First, in its current form, the ACCLAIM doctoral degree is administratively cumbersome: It requires extensive behind-the-scenes record keeping and lives a shadowy existence pieced together out of the courses and programs at each university. The CBI is seeking, with the help of its advisory board, to give the program a more substantial, efficient form. Second, the ACCLAIM doctoral program will, ideally, give its students access to the best classes and faculty that each university possesses. Faculty who are experts in mathematics or rural education may find distance education awkward. The CBI must not only gain skill at distance education, it must also find ways to package that skill for easy use by others. Third, the development of a network of ACCLAIM scholars – experts in the field living near the doctoral students, able to serve as mentors – is crucial if students are to grow as scholars and carry out their doctoral research. Finally, the CBI hopes to work closely with the many regional colleges and universities already training teachers in the ACCLAIM area.

Meet ACCLAIM's Capacity Building Initiative Advisory Board

The Capacity Building Initiative (CBI) of ACCLAIM seeks to increase the number of teachers in rural Appalachia holding advanced degrees in mathematics education. This entails, first and foremost, the design of the new ACCLAIM doctoral degree shared by the ACCLAM institutions. The composition of the CBI advisory board reflects this goal. Specifically, the board comprises the three CBI co-directors, the deans of the graduate schools at the ACCLAIM universities, assistant or associate deans of colleges of education at several of the ACCLAIM universities, authorities on mathematics, mathematics education, and rural education, and a member of the ACCLAIM internal evaluation team.

University of Kentucky:
Dr. Ron Eller Associate Professor of History, Scholar of American Social History, Appalachian History, and Southern History
Dr. Douglass S. Kalika Acting Dean of the Graduate School
Dr. Carl Lee Professor of Mathematics, CBI Co-director

University of Louisville:
Dr. Ron Atlas Dean of the Graduate School
Dr. Bill Bush Professor of Mathematics Education, College of Education and Human Development, Department of Teaching and Learning, and ACCLAIM Project Director
Dr. Linda Irwin-DeVitis Associate Dean for Programs, College of Education and Human Development

Marshall University:
Dr. Ron Childress Vice-President for Graduate Studies

Ohio University:
Dr. Bonnie Beach Assistant Dean, College of Education
Dr. Raymie E. McKerrow Associate Provost for Graduate Studies

University of Tennessee:
Dr. John Conway Head of Department of Mathematics
Dr. Reid Davis Assistant Professor of Mathematics and Outreach Mathematician, CBI Co-director
Dr. Thomas W. George Associate Dean of Student and Academic Services, College of Education
Dr. Vena Long Professor of Mathematics Education, College of Education, Department of Theory and Practice in Teacher Education, ACCLAIM Principal Investigator, and CBI Co-director
Dr. Anne Mayhew Vice Provost for Academic Affairs and Dean of Graduate Studies

Inverness Research Associates:
Dr. Michael Howard ACCLAIM Internal Evaluator

RURAL MATHEMATICS EDUCATOR
Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics

National Council of Teachers of Mathematics: Task Force on Mathematics Teaching and Learning in Poor Communities

The Board of Directors of the National Council of Teachers of Mathematics (NCTM) charged a special task force with investigating poverty's influence on student achievement. The Task Force on Mathematics Teaching and Learning in Poor Communities concluded, in a detailed report, that poverty was not merely an influence, but possibly the most important demographic factor affecting achievement. The report refers to several other studies, which found child poverty has a more significant influence on the achievement gap than race or gender. The assertions and findings contained in this report reflect the ideas and input of a diverse audience: the data and information were collected during a national conference of math professionals representative of poor communities.

The report discusses in depth how students learn mathematics; math teachers and teaching methods; and the influence of school, district, and community context. As the task force members participated in discussions with the convened group of educators, they realized that the lack of a common language for analysis and response inhibits wide-sweeping math reform across poor communities. The study highlights specific math education challenges poor communities face: the inability to attract quality math teachers, the transience of the student population, and the distractions that poverty-stricken children face (lack of health care, transportation, safety, and so on).

The task force identifies general recommendations for providing poor communities with better math education programs. The suggestions include reducing class size, increasing administrative support, providing appropriate and sustained professional development opportunities, raising teacher salaries, and creating a clearly defined math curriculum. The report also addresses how mathematics education must be sensitive to local contextual needs.

The full text of the report is available in PDF format and can be downloaded at:
http://www.nctm.org/about/committees/rac/tfpc/

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The Doubtful Role of Doubt

By Stephanie Starcher, RME editor

As educators, we have a tradition of copying programs, policies, and practices that have demonstrated their effectiveness elsewhere. But what impact, if any, has this tradition of importing practices had on the reform of mathematics education in rural schools and on our academic progress? This is a dangerous question because usually we strive to employ 'best practices' when we adopt programs recommended by professional associations, publishers, or consultants.

Where have the continuing "school improvement practices" led us in rural schools? Not very far, it seems.

There is a significant achievement gap in mathematics performance between students living in poor communities and those living in affluent ones and rural areas are poorer on average than urban ones. According to the USDA, poverty is commonly higher in rural areas (15.9 percent of the population in 1997) than in urban ones (12.6 percent the same year). During the four-year period between 1997 and 2000, rural poverty levels generally remained unchanged while urban poverty actually decreased (Stabber, 2001). Being poor often appears to correlate with languishing at the lower end of the achievement gap. The NCTM's new math curriculum standards, published in 2000, acknowledge that the learning needs of many student populations, particularly in poor communities, have been unfilled by long-standing practices (Setting the Record Straight: Commonsense Facts About the NCTM Standards, 2002).

Could the tradition of importing best practice from elsewhere really be a doubtful practice? After all, aren't we just trying to improve by adopting practices we're told are effective? Or is something else going on?

In the last issue, a colleague (see RME vol.1, no. 1) argued in favor of doubt as some protection against, well, snake oil. Ironically, rural educators have been practicing 'doubting' strategies for many, many years. We have a tendency to be constantly critical of reform ideas set forth by local peoples and we are unfailingly doubtful that ideas for math educational improvement lie locally. Haven't we all heard comments like, "What do the local people know about math?" So instead of looking to ourselves, we seek out expensive products or import expert consultants who do not understand the particular needs of rural schools and students. In some cases, such external resources may indeed raise mathematics performance, but I've found that too often a very slight rise in test scores comes at the expense of the rural community's development. Too often we equip students with mathematics that has limited meaning or usefulness in the rural setting.

Taking the notion of doubt one step further, I'd argue that rural educators should more often investigate and reject math practices and programs prescribed from afar. Don't get me wrong: I'm not arguing that students don't benefit most from real life applications of mathematics and extended exposure to problem-solving opportunities (Setting the Record Straight: Commonsense Facts to Clear the Air). Instead, I seriously doubt that such authenticity can be systematically developed. It requires inventive teaching, local knowledge, and –in our case—deep respect for rural people and places.

Time and again, best practices that have been suggested to me are standardized strategies that have allegedly raised student performance (elsewhere) on standardized assessments. But a one-size-fits all approach lacks personal connections to the rural lifeworld. These canned strategies do not reflect local things, especially what is meaningful to the rural student and community (see Haas and Nachtigal, 1998). Educational programs and practices require a very deep engagement with the local context in order to be successful for rural students. Otherwise, we ask our students to learn through processes that are foreign to them, in addition to asking them merely to assume that they will eventually (in a vague future adulthood) find the content personally valuable.

Of course, I'm inclined to be equally skeptical about local ideas and preferences. They need to be questioned, too. What I am strongly suggesting is that we pay a lot more attention to the perspective of rural communities.

Yes, surely, as my colleague insists, we should always ask for evidence and reasoning for supporting a particular practice or program, but I believe we should stop assuming that any claim that originates in a university, SEA, the US Department of Education, or (the usual case!) a commercial publisher has automatic merit! Nothing and no one has automatic merit; and nothing and no one is automatically without merit.

References:

Haas, T., & Nachtigal, P. (1998). Place value: An educator's guide to literature on rural lifeways, environments, and purposes of education. Charleston, WV: ERIC Clearing House on Rural Education and Small Schools.

Howley, C. (June, 2002). Doubt, what works, and the work of research. Rural Mathematics Educator, (1) 1.

National Council of Teachers of Mathematics. (2002). setting the record straight about changes in mathematics education: Commonsense facts about the NCTM standards. [On-line]. Available: http://www.nctm.org/news/speaksout/commonsense.htm

National Council of Teachers of Mathematics. (2002). Setting the record straight about changes in mathematics education: Commonsense facts to clear the air. [On-line]. Available: http://www.nctm.org/news/speaksout/commonsense.htm

National Council of Teachers of Mathematics. (2002). Teaching and learning mathematics in poor communities. [On-line]. Available: http://www.nctm.org/about/committees/rac/tfp.

Stauber, K.N. (2001). Why invest in rural American – and how? A critical public policy question for the 21st century. Federal Reserve Bank of Kansas City Economic Review. 2nd Quarter, 2001. [On-line]. Available: http://www.kc.frb.org/publicat/econrev/pdf/2q01stau.pdf

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What is Mathematics?

by James E. Schultz, Ohio University

Ask the average person to answer to the question "What is mathematics?" and you will probably get an answer relating to computation. Yet mathematicians who make their living doing mathematics actually do relatively little of the computation we think about, and may not even be all that good at it! So what is mathematics?

First let's agree that we are talking about the mathematics taught – or at least that should be taught – preschool to grade 12. While years ago mathematics was taught mostly as computation, the content taught in math classes is changing to reflect changes in the ways we use mathematics and what we know about learning and teaching it. Entire books have been written in answer to this question. In What is Mathematics? (1941) Courant and Robbins said, "Mathematics is an expression of the human mind which reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality." There is even another book, What is Mathematics, Really?, written in response to the earlier one.

Long ago the great scholar, Alfred North Whitehead (1940) said, "The study of mathematics is to commence in disappointment ... [because] its fundamental ideas are not explained to the student disentangled from the technical procedure which has been invented." Whitehead continued: "Without a doubt, technical facility is a first requisite. ... In this sense there is no royal road to learning. But it is equally an error to confine attention to technical processes, excluding consideration of general ideas. Here lies the road to pedantry." Against this backdrop we next examine mathematics from two perspectives, content strands and learning perspectives.

Mathematics Content Strands

To begin with, computation is just one of four major strands of school mathematics – and even then it is joined by estimation. With calculators, computers, and automatic cash registers performing most of the computations in the real world, a shift is needed in what basic skills are necessary. Just two days ago I was overcharged $80 at Best Buy because the clerk rang up the same item twice. It was estimation (not exact computation) that told me an error was made.

Patterns and algebra play another important role in contemporary mathematics. Harvard mathematician Bob Moses spoke of algebra in Radical Equations (2001) as a civil right, akin to the role that reading played in voting privileges in the civil rights movement years ago. Geometry and measurement as well as probability and statistics contain ideas much more important to the average person than outdated skills rarely used outside of schools, such as dividing fractions and factoring polynomials. The traditional curriculum is so obsessed with fractions that special calculators that handle fractions have been invented just for schools, because ordinary calculators used in the "real" world don't have these features.

Mathematics Learning Perspectives

Another perspective on mathematics learning and teaching comes from the view of skills, concepts, problem solving, and historical/cultural aspects. All of these are elements of each of the major strands. For example, it is an important skill to know how to find the area of a geometric figure, which might represent a wall to be painted or a lawn to be treated. It helps to know the concept of average when finding the average of 10 and 10. (People have been known to pull out calculators and enter 10 + 10 / 2 and arrived at an answer of 15, because the calculator correctly divides before adding.) In this problem there is nothing to compute, the concept of average tells you that the average of 10 and 10 must be 10, or similarly that the average of scores of 146 and 148 is 147.

To determine the rate of speed on the bike path if 6 miles are traveled in 30 minutes, you could use reasoning to conclude that covering 6 miles in half an hour is like covering 12 miles in an hour, unlike the girl who divided 30 by 6 and got 5. Her computational skill was perfect, but her problem solving was in error, because she applied the wrong computational skill (a true story).

Finally, it might be valuable for students facing life's challenges to know that Leonard Euler, a mathematician so prolific that he has the number e (important to economics and science) named in his honor, produced half of his work while he was blind (just as Beethoven wrote some of his best music when he was deaf).

An Example of the Changing Curriculum

When I went to high school many years ago, I learned to compute square roots by a paper-and-pencil process that I've long forgotten. Now we use calculators to do the same thing. So what should we know about square roots today? This example may help to see the point:

Suppose we are to construct a square pen with an area of 80 square feet to hold two dogs. How long is each side of the pen?

The first thing is realize in this problem solving situation is that we need to find SQRT 80 and that the number of dogs is immaterial to the question asked - except perhaps to the dogs. (How many students would see the 80 and 2 and answer 40?!) Then we use a calculator (not paper-and-pencil) skill to get an answer of about 8.9 feet. Finally, we check the answer for reasonableness by using the concept of square root to reason that the answer should be a bit less than the SQRT 81, which is 9. (In order not to be dependent on the calculator we need to know that SQRT 81 = 9 without the calculator.)

Conclusion

Returning to Courant and Robbins, "It is not philosophy but active experience in mathematics itself that alone can answer the question: What is mathematics?" Computation is an important part of mathematics, but only a part. Perhaps active is the key word in that sentence, written over sixty years ago but gaining more and more attention today. To learn more about what is going on with the mathematics curriculum, please follow the links at http://mathematicallysane.com

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Algebra Investigations Using Models: An Integrated Approach to Professional Development

Over the last decade, terms like collaboration, partnerships, systemic, and comprehensive have permeated educational projects and literature. Only in rare cases have different organizational units, with similar goals and purposes, been able to collaborate fully from their different perspectives to develop and support a professional development model that blends and truly aligns each organization's vectors to enhance content and strategies. ACCLAIM Summer Institute, Algebra Investigations Using Models, sponsored by the Marshall University ACCLAIM Collaborative, brought together middle, high school, and university educators for a common professional development experience focusing on improving the teaching of algebra at all levels. The Institute was held in Summersville, West Virginia, June 19-21, 2002.

Building upon a training package developed by Dr. Ron Pelfrey for ARSI and ACCLAIM, the West Virginia ACCLAIM Professional Development cadre modified the Professional Development agenda of "Algebra Investigations Using Models" to align the long range goals of Project Merit, an NSF funded mathematics project coordinated by West Virginia's Department of Education. The West Virginia ACCLAIM Professional Development Planning cadre was composed of Larry Lamb (Department of Education Mathematics Supervisor and Principal Investigator for Project MERIT), Dr. Thomas Klein and Dr. Karen Mitchell (Co-PI's and Directors of the ACCLAIM Teacher Education Initiative), and C. Carter Chambers (Marshall University Resource Collaborative Coordinator).

The team's overall goal was to invite teachers from different programmatic levels and geographic regions of the state to begin developing a broader vision of how to improve teaching and learning of algebra at the different levels. Specific objectives for the summer institute were to:

- gain knowledge of the use of high quality, standards-based instructional resources that can be implemented in the participant's classroom;
- become comfortable with the use of alternative methods of instruction and assessment of algebraic content;
- align algebraic activities and resources with state and national standards;
- discuss key issues with colleagues who teach algebra in the middle and high schools and colleges;
- develop on-going dialogue within the mathematics learning community of how best to teach and learn mathematical content.

Participants were organized into teams of three representing each of the three teaching levels. During the three days of training, the agenda stimulated conversations and in-depth comments around teaching and learning, using such tools as the four-pan balance, Algeblocks, Navigations, graphing calculators, and other instructional resources (participants received these and other resources to use in their classrooms). Judy and Jerry Pomeroy facilitated different sessions and topics, and Debbie Underwood and Barbara Wilson, Project Merit Regional Mentor Teachers, assisted with the assessment session instruction.

As a follow-up activity, each participant was given an assignment to develop a lesson plan for presenting an algebra concept to students using materials and strategies learned during these three days. The resulting plans will be shared during the November sessions. This activity is consistent with the literature on "lesson studies" as a strategy to improve teaching and learning.

According to workshop evaluations, the Institute provided intense professional development reflective of the equity issues that face all students in Appalachia. For more information concerning this unique approach to professional development, contact Carter Chambers at (888) 262-3006 or chambersc@Marshall.edu.

Teacher Education Initiative Sponsors Recent Conference

Housed in Huntington, West Virginia, and directed by Dr. Karen Mitchell and Dr. Thomas Klein, the Teacher Education Initiative aims to establish an organization of mathematics teacher educators, mathematicians, researchers, and K-12 teachers and administrators who are interested in investigating the issues that face mathematics teacher preparation. The organization is titled the Appalachian Association of Mathematics Teacher Educators (AAMTE) and is an affiliate of the national Association of Mathematics Teacher Educators (AMTE). The AAMTE will provide the structure to continue many of the activities of the Teacher Education Initiative beyond the period of the NSF grant that supports ACCLAIM.

The Teacher Education Initiative plans to support two conferences per year. The first one, Mathematics Teacher Preparation in Appalachia, was successfully held in Lexington, Kentucky, on August 16-17, 2002. Four nationally recognized speakers – Thomas Cooney, Alan DeYoung, Denise S. Mewborn, and Lew Romagnano – sparked animated discussions among the participants in the areas of mathematics content, the rural context, field experiences, and mathematics pedagogy. A second conference is planned for spring semester of 2003. This future conference will include preservice teachers, their college instructors, and award-winning public school mathematics teachers. The conference will provide many opportunities for preservice teachers to interact with talented mathematics teachers with years of experience, as well as teachers who have recently entered the field.

After the preparation and administration of a needs assessment to determine the strengths and weaknesses of mathematics teacher preparation programs in the institutions in the Appalachian regions of West Virginia, Ohio, Tennessee, and Kentucky, short courses and other forms of professional development for college faculty will be prepared and delivered. Some of the results of the needs assessment will be shared through the Research Initiative in the form of a landscape study. The Teacher Education Initiative also has worked collaboratively with the Professional Development Initiative to produce the "Algebra Investigations Using Models" workshop.

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News from the Research Initiative

ACCLAIM's Research Initiative, at Ohio University, has posted its first papers to the Research Clearinghouse. They are available at http://kant.citi.ohiou.edu/ACCLAIM/rc/rc.htm. Additional publications are in the works.

Working papers are essentially manuscripts-in-progress that have received light review and editing. Most working papers undergo continued development as journal article manuscripts, drafts of book chapters, study reports, or conference papers. We offer them as sources of timely information about rural math education – a field with a scattered literature base (see the varied resources in the research clearinghouse).

Although each of the four working papers addresses rural math education, the specific topics vary. Alan DeYoung writes about the dilemmas of academic and rural life. Bill Bush focuses on the available literature on culture and mathematics, and Craig Howley explores research on math achievement in rural places. Jim Schultz investigates rural math education in light of trends in math education.

Additional publications under development include a number of essays and syntheses, some with research agendas. For instance, Dennis Mulcahy (Memorial University, Newfoundland), assisted by Barbara Grover (Ohio University), is reviewing the literature on web-based delivery of math courses for rural schools and developing a related research agenda.

The Research Initiative also is organizing its first invitational symposium to be held in November near McArthur, Ohio (a suitably rural location). Ten nationally known scholars will discuss drafts of papers intended for subsequent publication by ACCLAIM. The long-range goal of this yearly event is to cultivate actual research collaborations involving teams of rural education and math education scholars.

Several studies are in progress under the guidance of the Research Initiative. Alan DeYoung (University of Kentucky), assisted by Ann Booth (Appalachian Rural Systemic Initiative and RI board member), is studying the social construction of the rural math teacher. Edwina Pendarvis (Marshall University), assisted by Bonnie Beach and Aimee Howley (both of Ohio University), is studying the experience of talented mathematics students. Marshall University's Karen Mitchell, with the assistance of Jim Schultz and Craig Howley (Ohio University), is assessing innovative curriculum materials for evidence of rural contextualization.

Finally, some important arrangements have been made with the Journal of Research in Rural Education (JRRE), the Educational Resources Information Center (ERIC), and the National Center for Education Statistics (NCES):

- The entire collection of JRRE articles will soon be available on the ACCLAIM web site in full text versions.
- ERIC has designated the Research Clearinghouse as the Adjunct Clearinghouse on Rural Mathematics Education; it is affiliated with the ERIC Clearinghouse on Rural Education and Small Schools.
- NCES has provided access to its major data sets under a special license to Ohio University's College of Education, specifically for use in ACCLAIM research.

Suggested Links . . .

Drexel University: The Math Forum Internet Library
The site contains links to journals, articles, discussions, and teacher resources specific to math education for all educational levels. Current key issues related to math education, such as equity and access, are featured in articles and other site links.
http://mathforum.org/library/

Math on the Web: American Mathematical Society
The site is oriented toward professional mathematicians by providing links to journals, books, and libraries related to math education. The site also allows you to access any of the American Mathematic Society's services and literature.
http://www.ams.org

Rural America: Journal of the Economic Research Service of the U.S. Department of Agriculture
This quarterly journal highlights issues and activities related to rural development. The articles feature the latest social and economic trends in rural areas.
http://www.ers.usda.gov/publications/ruralamerica/ra164

Mathematically Sane
The site advocates rational reform of school mathematics by providing educators with a forum for discussion and through the sharing of success stories based on anecdotal records and scientific data. Planners of math education can also use the literature resources and many links available at this site.
http://www.mathematicallysane.com/home.asp

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Publication Opportunities . . .

In addition to providing an excellent web site for math educators, Mathematically Sane accepts article submissions to include as part of its featured resources. Articles may be submitted electronically at the web site:
http://www.mathematicallysane.com/home.asp

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National or Regional Events

November 10-11, 2002, Manhattan, KS
Kansas State University Center for Rural Education and Small Schools and the College of Education
24th Annual Rural Education and Small Schools Conference
Contact: http://www2.educ.ksu.edu/Organizations/CRESS or 785-532-5886

November 22-23, 2002, Kingsport, TN
Upper Tennessee Council of Teachers of Mathematics
Algebra Two Day Institute: Grades Pk-12
Contact: http://www.nctm.org/academy/schedule.htm

March 28-30, 2002, Richmond, KY
Berea College and Eastern Kentucky University
26th Annual Appalachian Studies Conference
Contact: http://www.appalachianstudies.org

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Office of Educational Research and Improvement (OERI)
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